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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/591,867	06/12/2000	Tinku Acharya	042390.P8746	4736

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EXAMINER	
TRAN, NHAN T	

ART UNIT	PAPER NUMBER
2615	

DATE MAILED: 06/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/591,867	ACHARYA ET AL.	
	Examiner	Art Unit	
	Nhan T. Tran	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 June 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 11-20* is/are rejected.

7)☐ Claim(s) *7-10* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 June 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4, 5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to because Figure. 3 does not correctly show the m coordinate for B and R pixels on the right column. $B_{m-, n+1}$ and $R_{m+, n+1}$ are suggested to changed to -- $B_{m-1, n+1}$ and $R_{m+1, n+1}$ -- .

Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 5-7, 9, 11 & 12 are objected to because of reasons set forth below:

Claims 5-7, 9, 11 & 12 recite at least one of the limitations "**the** R color plane", "**the** B color planes", "**the** G color plane." There are insufficient antecedent basis for these limitations in the claims. Claims 7 & 9 further recite "**the** main diagonal and **the** secondary diagonal directions" which also lacks antecedent basis.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-6, 11-12, 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maenaka et al (US 5,552,827) in view of Fujino (US 6,125,525).

Regarding claim 1, Maenaka discloses a method to interpolate color pixel signal values comprising:

for a particular pixel location (i.e., a center pixel) in the subsampled image, comparing relative changes in color (i.e., G color) for two mutually orthogonal directions (i.e., vertical and

horizontal directions) across the particular pixel location (see col. 9, lines 1-31, wherein the vertical and horizontal correlation values Sv and Sh and relationship Kh + Kv = 1 are used to compare the relative changes);

computing a color signal value (i.e., either Ro, Go, Bo) for that particular pixel location for a color plane other than the color plane of the pixel signal value in the subsampled color image at that location, the computation including relatively weighing the relative changes in color, the relative weights, at least in part, on the difference in color value in one particular direction relative to the other. See Figs. 2, 8 & 9; col. 2, lines 36-48 and col. 9, lines 1-54.

It should be noted that R, G and B represent R, G and B color planes, respectively.

Maenaka does not teach comparing relative changes in hue and the relative weights depending, at least in part, on such the relative changes. Instead, Maenaka teaches comparing relative changes in G colors as shown in equations (13)-(16).

Fujino discloses a well-known correlation method for interpolation by using **at least one** of luminance, **hue** or saturation components of surrounding pixels of a pixel of interest to determine a proper interpolation process for the pixel of interest with respect to a pixel pair that has strongest correlation (see col. 1, lines 58-67).

Therefore, it would have been obvious to one of ordinary skill in the art to modify Maenaka to provide correlation values Sh, Sv and weighting coefficients Kh, Kv which are calculated based on relative changes **in hue** in one particular direction relative to the other in view of the teaching of using **hue** for correlation in Fujino as an obvious variation method.

Regarding claim 2, the combination of Maenaka and Fujino also contains computing a color signal that includes relatively weighing the differences in hue by relatively weighing more heavily the difference in hue associated with the direction having a difference in hue less relatively for the particular pixel location (see Maenaka, col. 9, lines 15-32 for the direction having a stronger correlation). Note that the analysis of claim 1 is also applied.

Regarding claims 3 & 4, Maenaka clearly discloses that the subsampled image comprises an image in RGB format of a Bayer pattern (see Figs. 8 & 13).

Regarding claim 5, it is also clear that the color plane of the pixel signal value at the particular pixel location comprises an R color plane; the two mutually orthogonal directions comprising the horizontal and vertical directions (see claim 1); the particular color plane for the color signal value being computed comprising an G color plane (see Figs. 8 and equations (9), (12) or (36) & (39) wherein missing R color is computed based on the color values green and red in the G and R color planes, respectively).

Regarding claim 6, it is similar to claim 5, wherein missing B color is computed based on color values of G and B of respective G and B color planes as shown in equations (6), (7) or (44)-(47).

Regarding claim 11, see the similar analyses of claims 5 & 6, wherein missing G color is computed based on color values of G and B of respective G and B color planes as shown in equations (22), (23) or (37) & (38).

Regarding claim 12, see claim 11 for similar analysis in which R color is also involved in calculation for missing G color as shown in equation (43).

Regarding claim 19, see the analysis of claim 1. Further, computing platform is represented by the circuitry shown in Fig. 2 or Fig. 14.

Regarding claim 20, see the analysis of claim 3.

4. Claims 13 - 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maenaka et al (US 5,552,827) in view of Fujino (US 6,215,525) and in view of Yamashita (US 5,513,281).

Regarding claim 13, the combination of Maenaka and Fujino as analyzed in claim 1 discloses the limitations of claim 13 by means of hardware system. Maenaka and Fujino do not expressly teach software instructions which are stored in a memory to be executed for interpolating color pixel values from a subsampled image. However, as suggested by Yamashita, it is obvious that interpolation process is either realized by means of hardware system or equivalent software procedures as described in col. 11, lines 31-34.

Therefore, it would have been obvious to one of ordinary skill in the art to implement the interpolation process taught by the combination of Maenaka and Fujino with an alternative configuration using software procedures stored in a memory, i.e., ROM or removable memory, instead of hardware circuitry.

Regarding claims 14 & 15, see the analyses of claims 3 & 4.

Regarding claim 16, see the analyses of claims 1 and 13, wherein "an integrated circuit" is inherently included in the combination of Maenaka, Fujino and Yamashita. At least, in order to execute the software procedures for interpolation process as suggested by Yamashita, an integrated circuit must be implemented (i.e., a CPU or a processor).

Regarding claims 17 & 18, see the analyses of claims 3 & 4.

Allowable Subject Matter

5. Claims 7-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 7 & 8, the prior art of record fails to teach or fairly suggest the

limitations of the color plane of the pixel signal value at the particular pixel location comprising the **R color plane**; the two mutually orthogonal direction comprising the main diagonal and the secondary diagonal directions; the particular color plane for the color signal value being computed comprising the **B color plane**.

Regarding claims 9 & 10, the prior art of record fails to teach or fairly suggest the limitations of the color plane of the pixel signal value at the particular pixel location comprising the **B color plane**; the two mutually orthogonal direction comprising the main diagonal and the secondary diagonal directions; the particular color plane for the color signal value being computed comprising the **R color plane**.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nhan T. Tran whose telephone number is (703) 605-4246. The examiner can normally be reached on Monday - Thursday, 8:00am - 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew B Christensen can be reached on (703) 308-9644. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

NT.

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